IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Satoru Okamoto	Art Unit	: 1792
Serial No.	: 10/689,617	Examiner	: Mahmoud Dahimene
Filed	: October 22, 2003	Conf. No.	: 4799
Title	: METHOD FOR CLEANING PLASMA ETCHING APPARATUS, METHOD FOR PLASMA ETCHING, AND METHOD FOR MANUFACTURING SEMICONDUCTOR DEVICE		

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Commissioner for Patents
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BRIEF ON APPEAL

(1) Real Party in Interest

The real party in interest is Semiconductor Energy Laboratory Co., Ltd. by virtue of an assignment.

(2) Related Appeals and Interferences

There are no related appeals or interferences.

(3) Status of Claims

Claims 1-95 are pending, with claims 1, 8, 15, 22, 29, 36, 43, 50, 57, 64, 71, 78, and 85 being independent. Claims 1-95 have been rejected, and appellant is appealing the rejection of claims 1-95.

(4) Status of Amendments

The claims have not been amended subsequent to the final rejection of April 22, 2008.

(5) Summary of Claimed Subject Matter

In the discussion below, reference numerals and references to particular portions of the specification are inserted for illustrative purposes only and are not meant to limit the scope of the claims.

Independent claim 1 recites a method for manufacturing a semiconductor device (page 13, lines 24-25 and Figs. 3A-3D). A semiconductor film (page 14, lines 24-25; element 7003; and Fig. 3A) is formed over a first substrate (page 14, lines 1-25; element 7001; and Fig. 3A), an insulating film (page 15, lines 21-22; element 7004; and Fig. 3A) is formed over the semiconductor film, a conductive film (page 16, lines 14-16; elements 7005 and 7006; and Fig. 3A) is formed over the insulating film, and a first etching is performed (page 17, lines 2-6 and Fig. 3B) in a chamber (page 25, lines 13-16; element 601; and Fig. 6) to form a first shape of the conductive film (page 17, lines 18-19; element 7008; and Fig. 3B). The chamber is cleaned (page 17, line 25 to page 18, line 4; page 25, lines 13-16; page 26, lines 6-11; and Fig. 6) by placing a second substrate (page 18, lines 3-5; page 25, line 13 to page 26, line 11; element 602; and Fig. 6) in the chamber, filling the chamber with a cleaning gas that includes Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas (page 18, lines 3-7; page 25, lines 17-21; and Fig. 6), and generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue (page 18, lines 3-17 and page 26, lines 8-11). The second substrate is not to form a semiconductor device (page 18, lines 3-4). The first substrate with the conductive film, the insulating film and the semiconductor film are placed in the cleaned chamber (page 17, line 24 to page 18, line 2 and page 18, lines 18-22), and a second etching is performed in the cleaned chamber to form a second shape of the conductive film (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C).

Independent claim 8 recites a method for manufacturing a semiconductor device (page 13, lines 24-25 and Figs. 3A-3D). A conductive film(page 16, lines 14-16; elements 7005 and 7006; and Fig. 3A) is formed over a substrate (page 14, lines 1-25; element 7001; and Fig. 3A), and a first etching (page 17, lines 2-6 and Fig. 3B) is performed in a chamber (page 25, lines 13-16; element 601; and Fig. 6) to form a first shape of the conductive film (page 17, lines 18-19; element 7008; and Fig. 3B). The chamber is cleaned (page 17, line 25 to page 18, line 4; page 25, lines 13-16; page 26, lines 6-11; and Fig. 6) by placing a dummy substrate (page 18, lines 3-5; page 25, line 13 to page 26, line 11; element 602; and Fig. 6) in the chamber, filling the chamber with a cleaning gas (page 18, lines 3-7; page 25, lines 17-21; and Fig. 6), and generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue (page 18, lines 3-17 and page 26, lines 8-11). The substrate with the conductive film

having the first shape is placed in the cleaned chamber (page 17, line 24 to page 18, line 2 and page 18, lines 18-22), and a second etching is performed in the cleaned chamber to form a second shape of the conductive film (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C).

Independent claim 15 recites a method for manufacturing a semiconductor device (page 13, lines 24-25 and Figs. 3A-3D). A semiconductor film (page 14, lines 24-25; element 7003; and Fig. 3A) is formed over a first substrate (page 14, lines 1-25; element 7001; and Fig. 3A), an insulating film (page 15, lines 21-22; element 7004; and Fig. 3A) is formed over the semiconductor film, and a conductive film having tungsten (page 16, lines 14-16; element 7006; and Fig. 3A) is formed over the insulating film. A first etching is performed (page 17, lines 2-6 and Fig. 3B) in a chamber (page 25, lines 13-16; element 601; and Fig. 6) to form a first shape of the conductive film (page 17, lines 18-19; element 7008; and Fig. 3B). The chamber is cleaned (page 17, line 25 to page 18, line 4; page 25, lines 13-16; page 26, lines 6-11; and Fig. 6) by placing a second substrate (page 18, lines 3-5; page 25, line 13 to page 26, line 11; element 602; and Fig. 6) in the chamber, filling the chamber with a cleaning gas that includes Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas (page 18, lines 3-7; page 25, lines 17-21; and Fig. 6), and generating plasma from the cleaning gas (page 18, lines 3-17 and page 26, lines 8-11). The second substrate is not to form the semiconductor device (page 18, lines 3-4). The first substrate with the conductive film including tungsten, the insulating film, and the semiconductor film is placed in the cleaned chamber (page 17, line 24 to page 18, line 2 and page 18, lines 18-22). A second etching is performed in the cleaned chamber to form a second shape of the conductive film (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C).

Independent claim 22 recites a method for manufacturing a semiconductor device (page 13, lines 24-25 and Figs. 3A-3D). A conductive film having tungsten (page 16, lines 14-16; element 7006; and Fig. 3A) is formed over a substrate (page 14, lines 1-25; element 7001; and Fig. 3A), and a first etching is performed (page 17, lines 2-6 and Fig. 3B) in a chamber (page 25, lines 13-16; element 601; and Fig. 6) to form a first shape of the conductive film (page 17, lines 18-19; element 7008; and Fig. 3B). The chamber is cleaned (page 17, line 25 to page 18, line 4; page 25, lines 13-16; page 26, lines 6-11; and Fig. 6) by placing a dummy substrate (page 18,

lines 3-5; page 25, line 13 to page 26, line 11; element 602; and Fig. 6) in the chamber, filling the chamber with a cleaning gas (page 18, lines 3-7; page 25, lines 17-21; and Fig. 6), and generating plasma from the cleaning gas (page 18, lines 3-17 and page 26, lines 8-11). The substrate with the conductive film having the first shape is placed in the cleaned chamber (page 17, line 24 to page 18, line 2 and page 18, lines 18-22), and a second etching is performed in the cleaned chamber to form a second shape of the conductive film (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C).

Independent claim 29 recites a method for manufacturing a semiconductor device (page 13, lines 24-25 and Figs. 3A-3D). A semiconductor film (page 14, lines 24-25; element 7003; and Fig. 3A) is formed over a first substrate (page 14, lines 1-25; element 7001; and Fig. 3A), an insulating film (page 15, lines 21-22; element 7004; and Fig. 3A) is formed over the semiconductor film, a first conductive film (page 16, lines 14-16; element 7005; and Fig. 3A) is formed over the insulating film, and a second conductive film (page 16, lines 14-16; element 7006; and Fig. 3A) is formed over the first conductive film. A first etching is performed (page 17, lines 2-6 and Fig. 3B) in a chamber (page 25, lines 13-16; element 601; and Fig. 6) to form a first shape of the first conductive film (page 17, lines 18-19; elements 7008, 7008a; and Fig. 3B) and a first shape of the second conductive film (page 17, lines 18-19; elements 7008, 7008a; and Fig. 3B). The chamber is cleaned (page 17, line 25 to page 18, line 4; page 25, lines 13-16; page 26, lines 6-11; and Fig. 6) by placing a second substrate (page 18, lines 3-5; page 25, line 13 to page 26, line 11; element 602; and Fig. 6) in the chamber, where the second substrate is not to form the semiconductor device (page 18, lines 3-4), filling the chamber with a cleaning gas including Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas (page 18, lines 3-7; page 25, lines 17-21; and Fig. 6), and generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue (page 18, lines 3-17 and page 26, lines 8-11). The first substrate with the second conductive film having the first shape, the first conductive film having the first shape, the insulating film, and the semiconductor film are placed in the cleaned chamber (page 17, line 24 to page 18, line 2 and page 18, lines 18-22). A second etching is performed in the cleaned chamber to form at least a second shape of the second conductive film (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C).

Independent claim 36 recites a method for manufacturing a semiconductor device (page 13, lines 24-25 and Figs. 3A-3D). A first conductive film (page 16, lines 14-16; element 7005; and Fig. 3A) is formed over a substrate (page 14, lines 1-25; element 7001; and Fig. 3A), a second conductive film (page 16, lines 14-16; element 7006; and Fig. 3A) is formed over the first conductive film, a first etching is performed (page 17, lines 2-6 and Fig. 3B) in a chamber (page 25, lines 13-16; element 601; and Fig. 6) to form a first shape of the first conductive film (page 17, lines 18-19; elements 7008, 7008a; and Fig. 3B) and a first shape of the second conductive film (page 17, lines 18-19; elements 7008, 7008b; and Fig. 3B). The chamber is cleaned (page 17, line 25 to page 18, line 4; page 25, lines 13-16; page 26, lines 6-11; and Fig. 6) by placing a dummy substrate (page 18, lines 3-5; page 25, line 13 to page 26, line 11; element 602; and Fig. 6) in the chamber, filling the chamber with a cleaning gas (page 18, lines 3-7; page 25, lines 17-21; and Fig. 6), and generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue (page 18, lines 3-17 and page 26, lines 8-11). The substrate with the second conductive film having the first shape and the first conductive film having the first shape are placed in the cleaned chamber (page 17, line 24 to page 18, line 2 and page 18, lines 18-22). A second etching is performed in the cleaned chamber to form at least a second shape of the second conductive film (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C).

Independent claim 43 recites a method for manufacturing a semiconductor device (page 13, lines 24-25 and Figs. 3A-3D). A semiconductor film (page 14, lines 24-25; element 7003; and Fig. 3A) is formed over a first substrate (page 14, lines 1-25; element 7001; and Fig. 3A), an insulating film (page 15, lines 21-22; element 7004; and Fig. 3A) is formed over the semiconductor film, a first conductive film (page 16, lines 14-16; element 7005; and Fig. 3A) is formed over the insulating film, a second conductive film (page 16, lines 14-16; element 7006; and Fig. 3A) is formed over the first conductive film, and the second conductive film and the first conductive film are etched (page 17, lines 2-6 and Fig. 3B) in a chamber (page 25, lines 13-16; element 601; and Fig. 6). The chamber is cleaned (page 17, line 25 to page 18, line 4; page 25, lines 13-16; page 26, lines 6-11; and Fig. 6) by placing a second substrate (page 18, lines 3-5; page 25, line 13 to page 26, line 11; element 602; and Fig. 6) in the chamber, where the second substrate is not to form the semiconductor device, filling the chamber with a cleaning gas

including Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas (page 18, lines 3-7; page 25, lines 17-21; and Fig. 6), and generating plasma from the cleaning gas (page 18, lines 3-17 and page 26, lines 8-11). The first substrate with the second conductive film, the first conductive film, the insulating film, and the semiconductor film are placed in the cleaned chamber (page 17, line 24 to page 18, line 2 and page 18, lines 18-22), and at least the second conductive film is etched in the cleaned chamber (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C).

Independent claim 50 recites a method for manufacturing a semiconductor device (page 13, lines 24-25 and Figs. 3A-3D). A first conductive film (page 16, lines 14-16; element 7005; and Fig. 3A) is formed over a substrate (page 14, lines 1-25; element 7001; and Fig. 3A), a second conductive film (page 16, lines 14-16; element 7006; and Fig. 3A) is formed over the first conductive film, and the second conductive film and the first conductive film are etched (page 17, lines 2-6 and Fig. 3B) in a chamber (page 25, lines 13-16; element 601; and Fig. 6). The chamber is cleaned (page 17, line 25 to page 18, line 4; page 25, lines 13-16; page 26, lines 6-11; and Fig. 6) by placing a dummy substrate (page 18, lines 3-5; page 25, line 13 to page 26, line 11; element 602; and Fig. 6) in the chamber, filling the chamber with a cleaning gas that includes Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas (page 18, lines 3-7; page 25, lines 17-21; and Fig. 6), and generating plasma from the cleaning gas (page 18, lines 3-17 and page 26, lines 8-11). The substrate with the second conductive film and the first conductive film are placed in the cleaned chamber (page 17, line 24 to page 18, line 2 and page 18, lines 18-22). At least the second conductive film is etched in the cleaned chamber (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C).

Independent claim 57 recites a method for manufacturing semiconductor devices (page 13, lines 24-25 and Figs. 3A-3D). A conductive film (page 16, lines 14-16; elements 7005 or 706; and Fig. 3A) is formed over an island shape semiconductor film (page 14, lines 24-25; element 7003; and Fig. 3A) with a gate insulating film (page 15, lines 21-22; element 7004; and Fig. 3A) interposed therebetween, the conductive film is etched (page 17, lines 2-6 and Fig. 3B) in a chamber (page 25, lines 13-16; element 601; and Fig. 6) to form a first shape of the conductive film (page 17, lines 18-19; element 7008; and Fig. 3B) by using an etching gas, the first etching gas is replaced in the chamber with a cleaning gas (page 18, lines 3-7; page 25, lines

17-21; and Fig. 6), plasma is generated from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue (page 18, lines 3-17 and page 26, lines 8-11), and the conductive film is etched in the cleaned chamber to form a second shape of the conductive film (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C).

Independent claim 64 recites a method for manufacturing semiconductor devices (page 13, lines 24-25 and Figs. 3A-3D). A conductive film (page 16, lines 14-16; elements 7005 and 7006; and Fig. 3A) is formed over an island shape semiconductor film (page 14, lines 24-25; element 7003; and Fig. 3A) with a gate insulating film (page 15, lines 21-22; element 7004; and Fig. 3A) interposed therebetween, the conductive film is etched (page 17, lines 2-6 and Fig. 3B) in a chamber (page 25, lines 13-16; element 601; and Fig. 6) to form a first shape of the conductive film (page 17, lines 18-19; element 7008; and Fig. 3B) by using an etching gas, a cleaning gas is introduced in the chamber (page 17, line 25 to page 18, line 4; page 25, lines 13-16; page 26, lines 6-11; and Fig. 6), plasma is generated from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue (page 18, lines 3-17 and page 26, lines 8-11), and the conductive film is etched in the cleaned chamber to form a second shape of the conductive film (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C).

Independent claim 71 recites a method for manufacturing semiconductor devices (page 13, lines 24-25 and Figs. 3A-3D). A first conductive film (page 16, lines 14-16; element 7005; and Fig. 3A) and a second conductive film (page 16, lines 14-16; element 7006; and Fig. 3A) are laminated in sequence over an island shape semiconductor film (page 14, lines 24-25; element 7003; and Fig. 3A) with a gate insulating film (page 15, lines 21-22; element 7004; and Fig. 3A) interposed therebetween, the first conductive film and the second conductive film are etched (page 17, lines 2-6 and Fig. 3B) in a chamber (page 25, lines 13-16; element 601; and Fig. 6) to form a first shape of the first conductive film (page 17, lines 18-19; elements 7008, 7008a; and Fig. 3B) and a first shape of the second conductive film (page 17, lines 18-19; elements 7008, 7008b; and Fig. 3B), respectively, by using an etching gas, and the etching gas in the chamber is replaced with cleaning gas (page 18, lines 3-7; page 25, lines 17-21; and Fig. 6). Plasma is generated from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue

(page 18, lines 3-17 and page 26, lines 8-11), the first shape of the first conductive film and the first shape of the second conductive film (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C) are etched in the chamber to form a second shape of the first conductive film (page 19, lines 6-12; elements 7010, 7010a; and Fig. 3C) and a second shape of the second conductive film (page 19, lines 6-12; elements 7010, 7010b; and Fig. 3C), respectively.

Independent claim 78 recites a method for manufacturing semiconductor devices (page 13, lines 24-25 and Figs. 3A-3D). A first conductive film (page 16, lines 14-16; element 7005; and Fig. 3A) and a second conductive film (page 16, lines 14-16; element 7006; and Fig. 3A) are laminated in sequence over an island shape semiconductor film (page 14, lines 24-25; element 7003; and Fig. 3A) with a gate insulating film (page 15, lines 21-22; element 7004; and Fig. 3A) interposed therebetween, the first conductive film and the second conductive film are etched (page 17, lines 2-6 and Fig. 3B) in a chamber (page 25, lines 13-16; element 601; and Fig. 6) to form a first shape of the first conductive film (page 17, lines 18-19; elements 7008, 7008a; and Fig. 3B) and a first shape of the second conductive film (page 17, lines 18-19; elements 7008, 7008b; and Fig. 3B), respectively. A cleaning gas is introduced in the chamber (page 18, lines 3-7; page 25, lines 17-21; and Fig. 6), plasma is generated from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue (page 18, lines 3-17 and page 26, lines 8-11), and the first shape of the first conductive film and the first shape of the second conductive film are etched in the chamber (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C) to form a second shape of the first conductive film (page 19, lines 6-12; elements 7010, 7010a; and Fig. 3C) and a second shape of the second conductive film (page 19, lines 6-12; elements 7010, 7010b; and Fig. 3C), respectively.

Independent claim 85 recites a method for manufacturing a semiconductor device (page 13, lines 24-25 and Figs. 3A-3D). A first conductive film (page 16, lines 14-16; element 7005; and Fig. 3A) and a second conductive film (page 16, lines 14-16; element 7006; and Fig. 3A) are laminated in sequence over an island shape semiconductor film (page 14, lines 24-25; element 7003; and Fig. 3A) with a gate insulating film (page 15, lines 21-22; element 7004; and Fig. 3A) interposed therebetween, the first conductive film and the second conductive film are etched (page 17, lines 2-6 and Fig. 3B) to form a first shape of the first conductive film (page 17, lines

18-19; elements 7008, 7008a; and Fig. 3B) and a first shape of the second conductive film (page 17, lines 18-19; elements 7008, 7008b; and Fig. 3B), respectively, by using a first etching gas. The first etching gas is replaced in a chamber (page 25, lines 13-16; element 601; and Fig. 6) with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas (page 18, lines 3-7; page 25, lines 17-21; and Fig. 6), where BO_x is adhered to an inside of the chamber as a residue. Plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas to remove the BO_x (page 18, lines 3-17 and page 26, lines 8-11), and the first shape of the first conductive film and the first shape of the second conductive film are anisotropically etched (page 17, line 24 to page 18, line 2; page 18, lines 18-22; page 19, lines 6-12; element 7010; and Fig. 3C) to form a second shape of the first conductive film (page 19, lines 6-12; elements 7010, 7010a; and Fig. 3C) and a second shape of the second conductive film (page 19, lines 6-12; elements 7010, 7010b; and Fig. 3C), respectively.

(6) Grounds of Rejection to be Reviewed on Appeal

Claims 1-13, 22-35, and 57-95 stand rejected as being unpatentable over U.S. Patent No. 6,872,322 (Chow) in view of U.S. Patent No. 6,566,270 (Liu), Silicon Processing for the VLSI Era (Wolf), U.S. Patent No. 5,756,400 (Ye), and U.S. Publication No. 2002/0053674 (Nakajima). Claims 15-19 and 21 stand rejected as being unpatentable over Chow in view of Liu, Wolf, and Nakajima. Claims 1, 2, 4, 5, 7-9, and 11-13 stand rejected as being unpatentable over U.S. Publication No. 2003/0222306 (Hoefler) in view of U.S. Publication No. 2002/0162827 (Yeh), Nakajima, and Ye. Claims 3, 6, 10, and 14 stand rejected s being unpatentable over Hoefler in view of Nakajima, Yeh, Ye, U.S. Publication No. 2002/0137352 (Nallan) and U.S. Patent No. 6,815,359 (Gabriel). Claims 15-21 and 22-28 stand rejected as being unpatentable over Hoefler in view of Yeh, Nakajima, and U.S. Publication No. 2002/0171085 (Suzawa). Claims 1, 2, 5, 7-9, 11, 12, 29, 30, 32, 50, and 51 stand rejected as being unpatentable over U.S. Publication No. 2002/0048829 (Yamazaki) in view of Nakajima, Yeh, and Ye. Claims 4, 13, and 34 stand rejected as being unpatentable over Yamazaki in view of Yeh, Nakajima, Ye, and U.S. Patent No. 6,221,200 (Saito). Claims 3, 6, 10, 14, 31, 33, 35-49, and 52-84 stand rejected as being unpatentable over Yamazaki in view of Yeh, Nakajima, Ye, Nallan, and Gabriel. Claims 36-42 stand rejected as being unpatentable over U.S. Patent No.

6,352,081 (Lu) in view of Chow, Ye, Nakajima, Liu, and Wolf. Claims 43-56 stand rejected as being unpatentable over Chow in view of Liu, Nakajima, and Wolf. Claims 42, 49, 56, 62, and 69 stand rejected as being unpatentable over Chow in view of Liu, Lu, U.S. Patent No. 6,842,658 (Izawa), Ye, Najajima, and Wolf.

(7) Argument

I. The rejection of claims 1-13, 22-35, and 57-95 as being unpatentable over Chow in view of Liu, Wolf, Ye, and Nakajima should be reversed.

With respect to claims 1-13 and 29-35, neither Chow, Liu, Wolf, Ye, Nakajima, nor any proper combination of the five describes or suggests performing an etching in a chamber to form a first shape of a conductive film that is over a first substrate, placing a second or dummy substrate in the chamber and removing BO_x adhered to an inside of the chamber, and then performing another etching in the chamber to form a second shape of the conductive film over the first substrate, as recited in independent claims 1, 8, and 29, and it would not have been obvious to modify Chow in the manner suggested by the Examiner.

Chow relates to a process for etching layers on a substrate 25 in an etching chamber 30 and cleaning a multilayer etchant residue formed on the surfaces of walls 45 of the etching chamber 30. See Chow at abstract; col. 5, lines 25-53; and Fig. 2. Chow explains that process gas is introduced into the chamber 30 through a gas distribution system 65 and cleaning gas is provided to the chamber 30 through a gas supply system 200. See Chow at col. 5, lines 54-63 and Fig. 2. After the process gas, which includes an etchant gas, is introduced into the chamber, a plasma is energized from the etchant gas using a plasma generator 110. See Chow at col. 8, lines 45-67 and Fig. 2.

However, Chow never suggests that a second or dummy substrate is placed in the etching chamber 30 to perform cleaning prior to performing another etching. Rather, Chow uses a single substrate (that forms the semiconductor device) during both etching and cleaning, which are performed simultaneously. As Chow explains, his basic process is set up to provide "simultaneous cleaning of the plasma etching chamber 30 in which the etching process is performed, without stopping the etching process." See Chow at col. 9, lines 1-4. Moreover, even in Chow's multiple etching step process, the cleaning gas is added to the etchant gas during

one of the etching stages to provide the simultaneous etching and cleaning with the single substrate 25. See Chow at col. 10, line 36 to col. 11, line 47 and Fig. 2. Additionally, Chow never suggests that the cleaning gas would generate plasma that removes BO_x adhered to the inside of the chamber as a residue. Rather, Chow explains that residues removed include "a silicon-containing material" or "fluorocarbon polymer." See Chow at col. 13, lines 51-67.

Liu, Wolf, Ye, and Nakajima do not remedy the failure of Chow to describe or suggest this subject matter. Liu's described cleaning process occurs after the only substrate that is mentioned is removed from the chamber prior to cleaning, and cleaning does not include placement of a dummy or a second substrate in the chamber. See Liu at abstract and Fig. 3. In Ye, interior surfaces of a plasma processing device can be dry cleaned using an inorganic halogenated gas mixture. See Ye at col. 6, lines 8-46. Ye explains that a workpiece 121 can be added to a chamber 110 for processing and then after removal of the workpiece 121, the dry cleaning process can be performed on the chamber 110. See Ye at col. 8, lines 18-45. However, Ye never describes or suggests that a second or dummy substrate is placed in the chamber 110 during cleaning or that, after cleaning the chamber, a second etching on the same workpiece 121 to form a second shape of a conductive film is performed. Rather, Ye's dry clean process is performed between discrete workpiece processing so that a new workpiece is inserted into the chamber after the dry cleaning. Both Wolf and Nakajima are silent regarding cleaning of a chamber.

Additionally, Liu, Wolf, Ye, and Nakajima never mention cleaning that includes generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue.

Accordingly, any proper combination of Chow, Liu, Wolf, Ye, and Nakajima would still fail to describe or suggest performing an etching in a chamber to form a first shape of a conductive film that is over a first substrate, placing a second or dummy substrate in the chamber and removing BO_x adhered to an inside of the chamber, and then performing another etching in the chamber to form a second shape of the conductive film over the first substrate, as recited in independent claims 1, 8, and 29.

Furthermore, it would not have been obvious to modify Chow to provide for a second or dummy substrate to be placed in the etching chamber 30 to perform cleaning prior to performing

another etching because such a modification of Chow would change the principle of operation of Chow's process, which is to provide for simultaneous cleaning and etching using the single substrate. For at least this reason, the teachings of Chow are not sufficient to render the claims prima facie obvious. See MPEP 2143.01.

In addition, Chow explains the unexpected discovery that the "chamber surfaces are cleaned and conditioned by the etchant and cleaning gas combination step, without requiring a separate chamber conditioning or seasoning step." See Chow at col. 9, lines 25-30. Chow further explains that "synergism of etching ... and simultaneously removing the etching residues from the surfaces of the chamber 30 (without terminating the etching process or requiring separate cleaning or conditioning steps) provides significantly improved process stability from substrate to substrate, and increased process throughput." See Chow at col. 9, lines 29-36.

Moreover, Chow teaches away from cleaning using a second or dummy substrate, and thus for this additional reason, the teachings of Chow are not sufficient to render the claims prima facie obvious. See MPEP 2143.01. In particular, Chow explains that "the increased cost per substrate that results from downtime of the etching chamber during the dry or wet cleaning and seasoning process steps, is undesirable. (emphasis added)" See Chow at col. 2, lines 31-34.

Accordingly, claims 1-13 and 29-35 are allowable over any proper combination of Chow, Liu, Wolf, Ye, and Nakajima, and their rejection should be reversed.

With respect to claims 22-28, neither Chow, Liu, Wolf, Ye, Nakajima, nor any proper combination of the five describes or suggests performing a first etching in a chamber to form a first shape of a conductive film that is over a substrate, cleaning the chamber using a dummy substrate, and performing a second etching in the cleaned chamber to form a second shape of the conductive film, as recited in independent claim 22, and because it would not have been obvious to modify Chow in the manner suggested by the Examiner. As discussed above, Chow uses a single substrate (that forms the semiconductor device) during both etching and cleaning, which are performed simultaneously, and Liu, Wolf, Ye, and Nakajima do not remedy the failure of Chow to describe or suggest cleaning a chamber using a dummy substrate prior to performing a second etching.

Accordingly, claims 22-28 are allowable over any proper combination of Chow, Liu, Wolf, Ye, and Nakajima, and their rejection should be reversed.

With respect to claims 57-95, neither Chow, Liu, Wolf, Ye, Nakajima, nor any proper combination of the five describes or suggests etching a conductive film in a chamber using an etching gas, generating plasma from a cleaning gas to remove BO_x adhered to an inside of the chamber as a residue, and then etching the conductive film in the cleaned chamber, as recited in independent claim 57, 64, 71, 78, and as similarly recited in independent claim 85. As discussed above, none of these references describes or suggests removing BO_x adhered to an inside of the chamber as a residue.

Accordingly, claims 57-95 are allowable over any proper combination of Chow, Liu, Wolf, Ye, and Nakajima, and their rejection should be reversed.

II. The rejection of claims 15-19 and 21 as being unpatentable over Chow in view of Liu, Wolf, and Nakajima should be reversed because neither Chow, Liu, Wolf, Nakajima, nor any proper combination of the four describes or suggests performing a first etching in a chamber to form a first shape of a conductive film that is over a substrate, cleaning the chamber using a second substrate, and performing a second etching in the cleaned chamber to form a second shape of the conductive film, as recited in independent claim 15, and because it would not have been obvious to modify Chow in the manner suggested by the Examiner.

As discussed above, Chow uses a single substrate (that forms the semiconductor device) during both etching and cleaning, which are performed simultaneously, and Liu, Wolf, and Nakajima do not remedy the failure of Chow to describe or suggest cleaning a chamber using a second substrate prior to performing a second etching.

Accordingly, claims 15-19 and 21 are allowable over any proper combination of Chow, Liu, Wolf, and Nakajima, and their rejection should be reversed.

III. The rejection of claims 1, 2, 4, 5, 7-9, and 11-13 as being unpatentable over Hoefler in view of Yeh, Nakajima, and Ye should be reversed because neither Hoefler, Yeh, Nakajima, Ye, nor any proper combination of the four describes or suggests performing an etching in a chamber to form a first shape of a conductive film, removing BO_x adhered to an inside of the chamber, and then performing another etching in the chamber to form a

second shape of the conductive film, as recited in independent claims 1 and 8, and because it would not have been obvious to modify Hoefler in the manner suggested by the Examiner.

In Hoefler, a semiconductor device 10 includes a substrate 12, and a semiconductor layer 18 over the substrate 12. See Hoefler at paragraphs 0014 and 0015. A conductive layer 34 is deposited by PVD on a gate dielectric 32 that is formed over the layer 18. See Hoefler at paragraph 0021 and Fig. 4. The conductive layer 34 is etched to form a gate electrode 36 and control electrodes 38. See Hoefler at paragraph 0022 and Fig. 5. However, Hoefler never suggests forming a first shape of the conductive layer 34 by etching in a chamber, generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue, and then performing a second etching in the cleaned chamber to form a second shape of the conductive layer 34.

Apparently realizing these deficiencies, the Examiner cites Yeh and appears to argue that Yeh shows these features. In Yeh, a processing chamber is dry cleaned using two cleaning steps, where residue on the interior surfaces of the chamber caused by photo-resist is removed by an oxygen based plasma in the first cleaning step and residue on the interior surfaces of the chamber caused by metal is removed by a chlorine-based plasma in the second cleaning step. See Yeh at abstract and paragraphs 0023 and 0025.

However, Yeh never describes or suggests that a plasma cleaning is performed between a first etching to form a first shape and a second etching to form a second shape. Yeh also fails to describe or suggest that the plasma cleaning in either of the two cleaning steps is for removing BO_x.

Moreover, Nakajima and Ye do not remedy the failure of Hoefler to describe or suggest this subject matter.

Accordingly, claims 1, 2, 4, 5, 7-9, and 11-13 are allowable over any proper combination of Hoefler, Yeh, Nakajim, and Ye, and their rejection should be reversed.

IV. The rejection of claims 3, 6, 10, and 14 as being unpatentable over Hoefler in view of Nakajima, Yeh, Ye, Nallan, and Gabriel should be reversed.

These claims depend from independent claims 1 or 8, which were rejected as being unpatentable over Hoefler in view of Yeh, Nakajima, and Ye. As discussed above, neither Hoefler, Yeh, Nakajima, Ye, nor any proper combination of the four describes or suggests performing an etching in a chamber to form a first shape of a conductive film, removing BO_x adhered to an inside of the chamber, and then performing another etching in the chamber to form a second shape of the conductive film, as recited in independent claims 1 and 8, and it would not have been obvious to modify Hoefler in the manner suggested by the Examiner. Moreover, neither Nallan nor Gabriel remedies the failure of Hoefler, Nakajima, Yeh, and Ye to describe or suggest this subject matter.

Nallan relates to a method for providing a stable plasma for etching of films. See Nallan at paragraph 0002. However, Nallan never describes or suggests a first etching of a conductive film in a chamber, a cleaning of the chamber, and then a second etching of the conductive film in the chamber. Rather, Nallan mentions only etching of films and teaches away from cleaning of a chamber by explaining that the method offers the advantage that "the process chamber in which the etching is carried out remains particularly clean during the etch process." See Nallan at paragraphs 0002 and 0035.

Gabriel relates to a photolithography system in which a wafer 24 is etched while positioned within a chamber 12. See Gabriel at col. 3, line 35 to col. 4, line 46 and col. 5, line 63 to col. 6, line 11. However, Gabriel never describes or suggests cleaning of the chamber 12 and then performing a second etching of the wafer 24 in the chamber 12 after the cleaning.

Accordingly, claims 1 and 8 are allowable over any proper combination of Hoefler, Nakajima, Yeh, Ye, Nallan, and Gabriel. For at least this reason, claims 3, 6, 10, and 14 are allowable for at least the reasons that claims 1 and 8 are allowable, and their rejection should be reversed.

V. The rejection of claims 15-28 as being unpatentable over Hoefler in view of Yeh, Nakajima, and Suzawa should be reversed because neither Hoefler, Yeh, Nakajima, Suzawa, nor any proper combination of the four describes or suggests performing a first etching in a chamber to form a first shape of a conductive film that is over a substrate, cleaning the chamber using a dummy or a second substrate, and performing a second

etching in the cleaned chamber to form a second shape of the conductive film, as recited in independent claims 15 and 22, and because it would not have been obvious to modify Hoefler in the manner suggested by the Examiner.

As discussed above, Hoefler's conductive layer 34 is etched to form the gate electrode 36 and the control electrodes 38. See Hoefler at paragraph 0022 and Fig. 5. But, Hoefler never describes or suggests forming a first shape of the conductive layer 34 by etching in a chamber, cleaning the chamber, and then performing a second etching in the cleaned chamber to form a second shape of the conductive layer 34. As also discussed above, Yeh and Nakajima do not remedy the failure of Hoefler to describe or suggest this subject matter.

Additionally, Suzawa does not remedy the failure of these references to describe or suggest this subject matter. In Suzawa, a first amorphous semiconductor film 1001 is etched using an etching gas to form source and drain electrodes. See Suzawa at abstract. However, Suzawa never describes or suggests cleaning a chamber in which the semiconductor film 1001 was etched, and then performing a second etching in the cleaned chamber to form a second shape of the semiconductor film 1001.

Accordingly, claims 15 and 22 are allowable over any proper combination of Hoefler, Yeh, Nakajima, and Suzawa. Claims 16-21 and 23-28 are allowable for at least the reasons that claims 15 and 22 are allowable, and their rejection should be reversed.

VI. The rejection of claims 1, 2, 5, 7-9, 11, 12, 29, 30, 32, 50, and 51 as being unpatentable over Yamazaki in view of Nakajima, Yeh, and Ye should be reversed.

With respect to claims 1, 2, 5, 7-9, 11, 12, 29, 30, and 32, neither Yamazaki, Nakajima, Yeh, Ye, nor any proper combination of the four describes or suggests performing an etching in a chamber to form a first shape of a conductive film, removing BO_x adhered to an inside of the chamber, and then performing another etching in the chamber to form a second shape of the conductive film, as recited in independent claims 1, 8, and 29, and it would not have been obvious to modify Yamazaki in the manner suggested by the Examiner.

In Yamazaki, a first conductive film 103 and a second conductive film 104 are formed over an insulation film 102, and the conductive films 103, 104 are subsequently etched. See Yamazaki at paragraphs 0011, 0012, and 0016. However, Yamazaki never describes or suggests

that, after etching the conductive film 103 or 104, a chamber is cleaned to remove BO_x adhered to an inside of the chamber, and performing a second etching in the cleaned chamber. Moreover, as discussed above, Yeh, Nakajima, and Ye do not remedy the failure of Yamazaki to describe or suggest this subject matter.

Accordingly, claims 1, 2, 5, 7-9, 11, 12, 29, 30, and 32 are allowable over any proper combination of Yamazaki, Nakajima, Yeh, and Ye, and their rejection should be reversed.

With respect to claims 50 and 51, neither Yamazaki, Nakajima, Yeh, Ye, nor any proper combination of the four describes or suggests etching first and second conductive films in a chamber, cleaning the chamber using a dummy substrate, and then etching at least the second conductive film in the cleaned chamber, as recited in independent claim 50, and it would not have been obvious to modify Yamazaki in the manner suggested by the Examiner.

Moreover, as similarly discussed above, neither Yamazaki, Nakajima, Yeh, Ye, nor any proper combination of the four describes or suggests etching a conductive film in a chamber, cleaning the chamber including placing a dummy substrate in the chamber, and then etching the conductive film in the cleaned chamber, as recited in independent claim 50. Accordingly, claim 50 and dependent claim 51 are allowable over any proper combination of Yamazaki, Nakajima, Yeh, and Ye, and their rejection should be reversed.

VII. The rejection of claims 4, 13, and 34 as being unpatentable over Yamazaki in Yeh, Nakajima, Ye, and Saito should be reversed.

These claims depend from one of independent claims 1, 8, and 29. As discussed above, neither Yamazaki, Nakajima, Yeh, Ye, nor any proper combination of the four describes or suggests performing an etching in a chamber to form a first shape of a conductive film, removing BO_x adhered to an inside of the chamber, and then performing another etching in the chamber to form a second shape of the conductive film, as recited in independent claims 1, 8, and 29, and it would not have been obvious to modify Yamazaki in the manner suggested by the Examiner. Moreover, Saito does not remedy the failure of these references to describe or suggest this subject matter.

In Saito, a semiconductor wafer dummy is fixed in a plasma etching chamber to remove a deposited silicon by etching. See Saito at col. 3, lines 20-49. However, Saito never describes or

suggests a first etching is performed in a chamber to form a first shape of a conductive film, cleaning the chamber including generating plasma from the cleaning gas to remove BOx adhered to an inside of the chamber as a residue, and then performing a second etching in the cleaned chamber to form a second shape of the conductive film. Accordingly, claims 1, 8, and 29 are allowable over any proper combination of Yamazaki, Yeh, Nakajima, Ye, and Saito. Claims 4, 13, and 34 are allowable for at least the reasons that claims 1, 8, and 29 are allowable, and their rejection should be reversed.

VIII. The rejection of claims 3, 6, 10, 14, 31, 33, 35-49, and 52-84 as being unpatentable over Yamazaki in view of Yeh, Nakajima, Ye, Nallan, and Gabriel should be reversed.

Claims, 3, 6, 10, 14, 31, 33, and 35 depend from one of independent claims 1, 8, or 29, which were rejected as being unpatentable over Yamazaki in view of Nakajima, Yeh, and Ye. As discussed above, neither Yamazaki, Nakajima, Yeh, Ye, nor any proper combination of the four describes or suggests performing an etching in a chamber to form a first shape of a conductive film, removing BO_x adhered to an inside of the chamber, and then performing another etching in the chamber to form a second shape of the conductive film, as recited in independent claims 1, 8, and 29, and it would not have been obvious to modify Yamazaki in the manner suggested by the Examiner. Moreover, as also discussed above, Nallan and Gabriel, alone or in combination, do not remedy the failure of these references to describe or suggest this subject matter. Accordingly, claims 1, 8, and 29 are allowable over any proper combination of Yamazaki, Nakajima, Yeh, Ye, Nallan, and Gabriel. Claims 3, 6, 10, 14, 31, 33, and 35 are allowable for at least the reasons that claims 1, 8, and 29 are allowable, and their rejection should be reversed.

Claims 52-56 depend from independent claim 50, which was rejected as being unpatentable over Yamazaki in view of Nakajima, Yeh, and Ye. As discussed above, neither Yamazaki, Nakajima, Yeh, Ye, nor any proper combination of the four describes or suggests etching first and second conductive films in a chamber, cleaning the chamber using a dummy substrate, and then etching at least the second conductive film in the cleaned chamber, as recited in independent claim 50, and it would not have been obvious to modify Yamazaki in the manner

suggested by the Examiner. Moreover, as also discussed above, Nallan and Gabriel do not remedy the failure of these references to describe or suggest this subject matter. Accordingly, claims 52-56 are allowable over any proper combination of Yamazaki, Nakajima, Yeh, Ye, Nallan, and Gabriel, and their rejection should be reversed.

With respect to claims 36-42, as similarly discussed above, neither Yamazaki, Yeh, Nakajima, Ye, Nallan, Gabriel, nor any proper combination of the six describes or suggests performing a first etching in a chamber to form a first shape of a conductive film, cleaning the chamber using a dummy substrate, and then performing a second etching in the cleaned chamber to form at least a second shape of the conductive film, as recited in independent claim 36, and it would not have been obvious to modify Yamazaki in the manner suggested by the Examiner. Accordingly, claims 36-42 are allowable over any proper combination of Yamazaki, Yeh, Nakajima, Ye, Nallan, and Gabriel, and their rejection should be reversed.

With respect to claims 43-49, as similarly discussed above, neither Yamazaki, Yeh, Nakajima, Ye, Nallan, Gabriel, nor any proper combination of the six describes or suggests etching a conductive film formed over a first substrate in a chamber, cleaning the chamber using a second substrate, and then etching the conductive film in the cleaned chamber, as recited in independent claim 43, and it would not have been obvious to modify the references in the manner suggested by the Examiner. Accordingly, claims 43-49 are allowable over any proper combination of Yamazaki, Yeh, Nakajima, Ye, Nallan, and Gabriel, and their rejection should be reversed.

With respect to claims 57-84, as similarly discussed above, neither Yamazaki, Yeh, Nakajima, Ye, Nallan, Gabriel, nor any proper combination of the six describes or suggests etching a conductive film in a chamber to form a first shape of the conductive film, removing BO_x adhered to an inside of the chamber, and etching the conductive film in the cleaned chamber to form a second shape of the conductive film, as recited in independent claims 57, 64, 71, and 78, and it would not have been obvious to modify the references in the manner suggested by the Examiner. Accordingly, claims 57-84 are allowable over any proper combination of Yamazaki, Yeh, Nakajima, Ye, Nallan, and Gabriel, and their rejection should be reversed.

IX. The rejection of claims 36-42 as being unpatentable over Lu in view of Chow, Ye, Nakajima, Liu, and Wolf should be reversed because neither Lu, Chow, Ye, Nakajima, Liu, Wolf, nor any proper combination of the six describes or suggests performing a first etching in a chamber to form a first shape of a conductive film, cleaning the chamber using a dummy substrate and generating plasma to remove BO_x adhered to an inside of the chamber, and then performing a second etching in the cleaned chamber to form at least a second shape of the conductive film, as recited in independent claim 36, and it would not have been obvious to modify Lu in the manner suggested by the Examiner.

Lu relates to a dry cleaning method for removing deposited etch byproducts from surfaces of a semiconductor processing chamber after a copper etch process is performed in the chamber. See Lu at abstract. However, Lu never describes or suggests that the chamber is cleaned in part by removing BO_x adhered to an inside of the chamber and that a second etching in the cleaned chamber is performed to form a second shape of a conductive film on which a first shape was already formed by performing a first etching in the chamber. Lu merely explains that the cleaning method can be "performed between wafer processing runs without opening the processing chamber, thereby minimizing potential contamination to the chamber as well as chamber downtime." See Lu at abstract.

Additionally, as discussed above with respect to claims 1 and 8, Chow, Ye, Nakajima, Liu, and Wolf do not remedy the failure of Lu to describe or suggest this subject matter. Accordingly, claim 36 is allowable over any proper combination of Lu, Chow, Ye, Nakajima, Liu, and Wolf. Claims 37-41 are allowable for at least the reasons that claim 36 is allowable, and their rejection should be reversed.

X. The rejection of claims 43-56 as being unpatentable over Chow in view of Liu, Nakajima, and Wolf should be reversed because neither Chow, Liu, Nakajima, Wolf, nor any proper combination of the four describes or suggests etching a conductive film formed over a substrate in a chamber, cleaning the chamber using a second or a dummy substrate, and then etching the conductive film in the cleaned chamber, as recited in independent claims 43 and 50, and it would not have been obvious to modify Chow in the manner suggested by the Examiner.

As discussed above, Chow uses a single substrate (that forms the semiconductor device) during both etching and cleaning, which are performed simultaneously. As also discussed above, Liu, Nakajima, and Wolf do not remedy the failure of Chow to describe or suggest this subject matter. Accordingly, claims 43-56 are allowable over any proper combination of Chow, Liu, Nakajima, and Wolf, and their rejection should be reversed.

XI. The rejection of claims 42, 49, 56, 62, and 69 as being unpatentable over Chow in view of Liu, Lu, Izawa, Ye, Nakajima, and Wolf should be reversed.

Claim 42 depends from independent claim 36, which was rejected as being unpatentable over Lu in view of Chow, Ye, Nakajima, Liu, and Wolf. As discussed above, neither Lu, Chow, Ye, Nakajima, Liu, Wolf, nor any proper combination of the six describes or suggests performing a first etching in a chamber to form a first shape of a conductive film, cleaning the chamber using a dummy substrate and removing BO_x adhered to an inside of the chamber as a residue, and then performing a second etching in the cleaned chamber to form at least a second shape of the conductive film, as recited in independent claim 36, and it would not have been obvious to modify Lu in the manner suggested by the Examiner.

Moreover, Izawa does not remedy the failures of these references to describe or suggest this subject matter. Rather, in Izawa, a wafer is placed in a plasma processing chamber 1 to etch an antireflection coating on the wafer and then the wafer is moved to a gate processing chamber in which a gate electrode is etched on the wafer. See Izawa at col. 9, lines 13-35. Izawa never discloses performing a first etching in a chamber to form a first shape of a conductive film, cleaning the chamber including removing BO_x adhered to an inside of the chamber, and then performing a second etching in the cleaned chamber to form a second shape of the conductive film.

Accordingly, claim 36 is allowable over any proper combination of Chow, Liu, Lu, Izawa, Ye, Nakajima, and Wolf, as is claim 42, and their rejection should be reversed.

Claims 62 and 69 depend from one of independent claims 57 or 64, which were rejected as being unpatentable over Chow in view of Liu, Wolf, Ye, and Nakajima. As discussed above, neither Chow, Liu, Wolf, Ye, Nakajima, nor any proper combination of the five describes or suggests etching a conductive film in a chamber to form a first shape of the conductive film,

removing BO_x adhered to an inside of the chamber, and etching the conductive film in the cleaned chamber to form a second shape of the conductive film, as recited in independent claims 57 and 64, and it would not have been obvious to modify Chow in the manner suggested by the Examiner. Moreover, as discussed above, Izawa and Lu do not remedy the failure of these references to describe or suggest this subject matter. Accordingly, claims 57 and 64 are allowable over any proper combination of Chow, Liu, Lu, Izawa, Ye, Nakajima, and Wolf, as are claims 62 and 69, and their rejection should be reversed.

Claims 49 and 56 depend from one of independent claims 43 or 50, which were rejected as being unpatentable over Chow in view of Liu, Nakajima, and Wolf. As discussed above, neither Chow, Liu, Nakajima, Wolf, nor any proper combination of the four describes or suggests etching a conductive film formed over a substrate in a chamber, cleaning the chamber using a second or a dummy substrate, and then etching the conductive film in the cleaned chamber, as recited in independent claims 43 and 50, and it would not have been obvious to modify Chow in the manner suggested by the Examiner. Moreover, as discussed above, Izawa and Lu do not remedy the failure of these references to describe or suggest this subject matter. Accordingly, claims 43 and 50 are allowable over any proper combination of Chow, Liu, Lu, Izawa, Ye, Nakajima, and Wolf, as are claims 49 and 56, and their rejection should be reversed.

In conclusion, appellant submits that all claims are in condition for allowance. The fee in the amount of \$670 in payment of the one-month extension of time fee (\$130) and the brief fee (\$540) is being paid concurrently herewith on the Electronic Filing System (EFS) by way of Deposit Account authorization.

Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: October 14, 2008

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Appendix of Claims

1. A method for manufacturing a semiconductor device, the method comprising:

forming a semiconductor film over a first substrate;

forming an insulating film over the semiconductor film;

forming a conductive film over the insulating film;

performing a first etching in a chamber to form a first shape of the conductive film;

cleaning the chamber, the cleaning comprising:

placing a second substrate in the chamber, wherein said second substrate is not to form a semiconductor device;

filling the chamber with a cleaning gas, said cleaning gas comprising Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas; and

generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue;

placing the first substrate with the conductive film, the insulating film and the semiconductor film in the cleaned chamber; and

performing a second etching in the cleaned chamber to form a second shape of the conductive film.

2. The method of claim 1, wherein etching includes etching using a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method.

3. The method of claim 1, wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

4. The method of claim 1, wherein the second substrate includes quartz.

5. The method of claim 1, wherein cleaning includes replacing an etching gas in the chamber with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas each of which is added with O_2, and plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2.

6. The method of claim 1, wherein part of the inner surface of the chamber is quartz.

7. The method of claim 1, wherein forming the semiconductor film over the substrate includes forming an island shaped semiconductor film over the substrate.

8. A method for manufacturing a semiconductor device, the method comprising:

forming a conductive film over a substrate;

performing a first etching in a chamber to form a first shape of the conductive film;

cleaning the chamber, the cleaning comprising:

placing a dummy substrate in the chamber;

filling the chamber with a cleaning gas; and

generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue;

placing the substrate with the conductive film having the first shape in the cleaned chamber; and

performing a second etching in the cleaned chamber to form a second shape of the conductive film.

9. The method of claim 8, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method.

10. The method of claim 8, wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

11. The method of claim 8, wherein the substrate is a glass substrate.

12. The method of claim 8, wherein the plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2.

13. The method of claim 8, wherein the dummy substrate includes quartz.

14. The method of claim 8, wherein part of the inner surface of the chamber is quartz.

15. A method for manufacturing a semiconductor device, the method comprising:

forming a semiconductor film over a first substrate;

forming an insulating film over the semiconductor film;

forming a conductive film comprising tungsten over the insulating film;

performing a first etching in a chamber to form a first shape of the conductive film;

cleaning the chamber, the cleaning comprising:

placing a second substrate in the chamber, wherein said second substrate is not to form the semiconductor device;

filling the chamber with a cleaning gas, said cleaning gas comprising Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas; and

generating plasma from the cleaning gas;

placing the first substrate with the conductive film comprising tungsten, the insulating film, and the semiconductor film in the cleaned chamber; and

performing a second etching in the cleaned chamber to form a second shape of the conductive film.

16. The method of claim 15, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method.

17. The method of claim 15, wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

18. The method of claim 15, wherein the dummy substrate includes quartz.

19. The method of claim 15, wherein cleaning the chamber includes generating the plasma from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2.

20. The method of claim 15, wherein cleaning the chamber includes removing BO_x from an inner surface of the chamber.

21. The method of claim 15, wherein etching the conductive film includes etching the conductive film with a plasma generated from a mixture of Cl_2, SF_6, and O_2.

22. A method for manufacturing a semiconductor device, the method comprising:

forming a conductive film comprising tungsten over a substrate;

performing a first etching in a chamber to form a first shape of the conductive film;

cleaning the chamber, the cleaning comprising:

placing a dummy substrate in the chamber;

filling the chamber with a cleaning gas; and

generating plasma from the cleaning gas;

placing the substrate with the conductive film having the first shape in the cleaned chamber; and

performing a second etching in the cleaned chamber to form a second shape of the conductive film.

23. The method of claim 22, wherein cleaning includes etching the chamber using an etching method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

24. The method of claim 22, wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

25. The method of claim 22, wherein the substrate is a glass substrate.

26. The method of claim 22, wherein cleaning includes replacing an etching gas in the chamber with the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2, and plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2.

27. The method of claim 22, wherein cleaning includes replacing an etching gas in the chamber with the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas.

28. The method of claim 22, wherein the dummy substrate includes quartz.

29. A method for manufacturing a semiconductor device, the method comprising:

forming a semiconductor film over a first substrate;

forming an insulating film over the semiconductor film;

forming a first conductive film over the insulating film;

forming a second conductive film over the first conductive film;

performing a first etching in a chamber to form a first shape of the first conductive film and a first shape of the second conductive film;

cleaning the chamber, the cleaning comprising:

placing a second substrate in the chamber, wherein said second substrate is not to form the semiconductor device;

filling the chamber with a cleaning gas, said cleaning gas comprising Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas; and

generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue,

placing the first substrate with the second conductive film having the first shape, the first conductive film having the first shape, the insulating film, and the semiconductor film in the cleaned chamber; and

performing a second etching in the cleaned chamber to form at least a second shape of the second conductive film.

30. The method of claim 29, further comprising etching the inside of the chamber with the generated plasma, wherein etching includes a method selected form the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method.

31. The method of claim 29, wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

32. The method of claim 29, wherein forming the semiconductor film over the first substrate includes forming an island shaped semiconductor film over the substrate.

33. The method of claim 29, wherein:

filling the chamber with Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas includes filling the chamber with the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas and adding O_2 to the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas such that the plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas, and the added O_2.

34. The method of claim 29, wherein the second substrate includes quartz.

35. The method of claim 29, further comprising etching the inside of the chamber with the generated plasma such that BO_x is removed from an inner surface of the chamber.

36. A method for manufacturing a semiconductor device, the method comprising:

forming a first conductive film over a substrate;

forming a second conductive film over the first conductive film;

performing a first etching in a chamber to form a first shape of the first conductive film and a first shape of the second conductive film;

cleaning the chamber, the cleaning comprising:

placing a dummy substrate in the chamber;

filling the chamber with a cleaning gas; and

generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue;

placing the substrate with the second conductive film having the first shape and the first conductive film having the first shape in the cleaned chamber; and

performing a second etching in the cleaned chamber to form at least a second shape of the second conductive film.

37. The method of claim 36, further comprising etching the inside of the chamber with the generated plasma, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method.

38. The method of claim 36, wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

39. The method of claim 36, wherein the substrate is a glass substrate.

40. The method of claim 36, wherein:

filling the chamber with Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas includes filling the chamber with the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas and adding O_2 to the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas such that plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas, and the added O_2.

41. The method of claim 36, wherein the dummy substrate includes quartz.

42. The method of claim 36, further comprising etching the inside of the chamber with the generated plasma such that BO_x is removed from the inside of the chamber.

43. A method for manufacturing a semiconductor device, the method comprising:

forming a semiconductor film over a first substrate;

forming an insulating film over the semiconductor film;

forming a first conductive film over the insulating film;

forming a second conductive film over the first conductive film;

etching the second conductive film and the first conductive film in a chamber;

cleaning the chamber, the cleaning comprising:

placing a second substrate in the chamber, wherein said second substrate is not to form the semiconductor device;

filling the chamber with a cleaning gas, said cleaning gas comprising Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas; and

generating plasma from the cleaning gas,

placing the first substrate with the second conductive film, the first conductive film, the insulating film, and the semiconductor film in the cleaned chamber; and

etching at least the second conductive film in the cleaned chamber.

44. The method of claim 43, further comprising etching the inside of the chamber with the generated plasma, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method.

45. The method of claim 43, wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

46. The method of claim 43, wherein forming the semiconductor film over the first substrate includes forming an island shaped semiconductor film over the substrate.

47. The method of claim 43, wherein the etching gas is replaced with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas each of which is added with O_2, and plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2.

48. The method of claim 43, wherein the second substrate includes quartz.

49. The method of claim 43, further comprising etching the inside of the chamber with the generated plasma such that BO_x is removed from the inside of the chamber.

50. A method for manufacturing a semiconductor device, the method comprising:

forming a first conductive film over a substrate;

forming a second conductive film over the first conductive film;

etching the second conductive film and the first conductive film in a chamber;

cleaning the chamber, the cleaning comprising:

placing a dummy substrate in the chamber;

filling the chamber with a cleaning gas, said cleaning gas comprising Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas; and

generating plasma from the cleaning gas,

placing the substrate with the second conductive film and the first conductive film in the cleaned chamber; and

etching at least the second conductive film in the cleaned chamber.

51. The method of claim 50, further comprising etching the inside of the chamber with the generated plasma, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method.

52. The method of claim 50, wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

53. The method of claim 50, wherein the first substrate is a glass substrate.

54. The method of claim 50, wherein:

replacing the etching gas includes replacing the etching gas with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas each of which is added with O_2, and

generating the plasma includes generating the plasma from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2.

55. The method of claim 50, wherein the dummy substrate includes quartz.

56. The method of claim 50, further comprising etching the inside of the chamber with the generated plasma such that BO_x is removed from the inside of the chamber.

57. A method for manufacturing semiconductor devices, the method comprising:

forming a conductive film over an island shape semiconductor film with a gate insulating film interposed therebetween;

etching the conductive film in a chamber to form a first shape of the conductive film by using an etching gas;

replacing the first etching gas in the chamber with a cleaning gas;

generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue; and

etching the conductive film in the cleaned chamber to form a second shape of the conductive film.

58. The method of claim 57, wherein etching includes etching using a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method.

59. The method of claim 57, wherein the cleaning gas comprises Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas, and wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

60. The method of claim 57, further comprising placing a dummy substrate in the chamber during cleaning.

61. The method of claim 57, wherein the etching gas is replaced with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas each of which is added with O_2, and plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2.

62. The method of claim 57, wherein part of the inner surface of the chamber is quartz.

63. The method of claim 60, wherein the dummy substrate includes quartz.

64. A method for manufacturing semiconductor devices, the method comprising:

forming a conductive film over an island shape semiconductor film with a gate insulating film interposed therebetween;

etching the conductive film in a chamber to form a first shape of the conductive film by using an etching gas;

introducing a cleaning gas in the chamber;

generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue; and

etching the conductive film in the cleaned chamber to form a second shape of the conductive film.

65. The method of claim 64, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon

wave etching method, a helical resonance etching method and a pulse modulation etching method.

66. The method of claim 64, wherein the cleaning gas comprises Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas, and wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

67. The method of claim 64, further comprising placing a dummy substrate in the chamber during cleaning.

68. The method of claim 64, wherein the etching gas is replaced with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas each of which is added with O_2, and plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2.

69. The method claim 64, wherein part of the inner surface of the chamber is quartz.

70. The method of claim 67, wherein the dummy substrate includes quartz.

71. A method for manufacturing semiconductor devices,the method comprising:

laminating a first conductive film and a second conductive film in sequence over an island shape semiconductor film with a gate insulating film interposed therebetween;

etching the first conductive film and the second conductive film in a chamber to form a first shape of the first conductive film and a first shape of the second conductive film, respectively, by using an etching gas;

replacing the etching gas in the chamber with cleaning gas;

generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue; and

etching the first shape of the first conductive film and the first shape of the second conductive film in the chamber to form a second shape of the first conductive film and a second shape of the second conductive film, respectively.

72. The method of claim 71, further comprising etching the inside of the chamber with the generated plasma, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method.

73. The method of claim 71, wherein the cleaning gas comprises Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas, and wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

74. The method of claim 71, placing a dummy substrate in the chamber during cleaning.

75. The method claim 71, wherein:

replacing the etching gas in the chamber with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas includes replacing the etching gas with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas, and O_2, and

generating the plasma includes generating the plasma from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas, and the O_2.

76. The method for of claim 74, wherein the dummy substrate includes quartz.

77. The method of claim 71, further comprising etching the inside of the chamber with the generated plasma such that BO_x is removed from an inner surface of the chamber.

78. A method for manufacturing semiconductor devices, the method comprising:

laminating a first conductive film and a second conductive film in sequence over an island shape semiconductor film with a gate insulating film interposed therebetween;

etching the first conductive film and the second conductive film in a chamber to form a first shape of the first conductive film and a first shape of the second conductive film, respectively;

introducing a cleaning gas in the chamber;

generating plasma from the cleaning gas to remove BO_x adhered to an inside of the chamber as a residue; and

etching the first shape of the first conductive film and the first shape of the second conductive film in the chamber to form a second shape of the first conductive film and a second shape of the second conductive film, respectively.

79. The method of claim 78, further comprising etching the inside of the chamber with the generated plasma, wherein etching includes a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method.

80. The method of claim 78, wherein the cleaning gas comprises Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas, and wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

81. The method of claim 78, further comprising placing a dummy substrate in the chamber while the chamber is being cleaned.

82. The method of claim 78, wherein:

the etching gas is replaced with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas each of which is added with O_2, and

the plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2.

83. The method of claim 81, wherein the dummy substrate includes quartz.

84. The method of claim 78, further comprising etching the inside of the chamber with the generated plasma such that BO_x is removed from the inside surface of the chamber.

85. A method for manufacturing a semiconductor device comprising the steps of:

laminating a first conductive film and a second conductive film in sequence over an island shape semiconductor film with a gate insulating film interposed therebetween;

etching the first conductive film and the second conductive film to form a first shape of the first conductive film and a first shape of the second conductive film, respectively, by using a first etching gas;

replacing the first etching gas in a chamber with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas wherein BO_x is adhered to an inside of the chamber as a residue;

generating plasma from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas to remove the BO_x; and

anisotropic etching the first shape of the first conductive film and the first shape of the second conductive film to form a second shape of the first conductive film and a second shape of the second conductive film, respectively.

86. A method for manufacturing a semiconductor device according to claim 85, wherein a width of the second shape of the first conductive film is longer than that of the second shape of the second conductive film in a channel length direction.

87. A method for manufacturing a semiconductor device according to claim 85, wherein a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

88. A method for manufacturing a semiconductor device according to claim 86, wherein a method selected from the group consisting of an RIE etching method, an ICP etching method, an ECR etching method, a helicon wave etching method, a helical resonance etching method and a pulse modulation etching method is adopted in the plasma etching apparatus.

89. A method for manufacturing a semiconductor device according to claim 85, wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

90. A method for manufacturing a semiconductor device according to claim 86, wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

91. A method for manufacturing a semiconductor device according to claim 87, wherein the fluorine-based gas is selected from the group consisting of CF_4, SF_6 and NF_3.

92. A method for manufacturing a semiconductor device according to claim 85, wherein an etching gas is replaced with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas, or Cl_2 gas

each of which is added with O_2, and plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2 to remove the BO_x.

93. A method for manufacturing a semiconductor device according to claim 86, wherein the etching gas is replaced with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas each of which is added with O_2, and plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2 to remove the BO_x.

94. A method for manufacturing a semiconductor device according to claim 87, wherein the etching gas is replaced with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas each of which is added with O_2, and plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2 to remove the BO_x.

95. A method for manufacturing a semiconductor device according to claim 89, wherein the etching gas is replaced with Cl_2 or a mixed gas of Cl_2 and a fluorine-based gas each of which is added with O_2, and plasma is generated from the Cl_2 or the mixed gas of Cl_2 and the fluorine-based gas each of which is added with O_2 to remove the BO_x.

Evidence Appendix

NONE

Related Proceedings Appendix

NONE